MULTIMEDIA   UNIVERSITY

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2017/2018

BDS4614 – MANAGEMENT DECISION SCIENCE
(All sections / Groups)

06 MARCH 2018
9.00 a.m. – 12.00 p.m.
(3 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 6 pages excluding the cover page.

2. Answer ALL questions. The distribution of the marks are given for all questions.

3. Write all your answers in the Answer Booklet provided.

4. The statistical table is attached at the end of this question paper.

Question 1

Gemini Air Conditioning manufactures three home air conditioners: an economy model, a standard model, and a deluxe model. The profits per unit are \$63, \$95 and \$135, respectively. The production requirements per unit are as follows:

	Number of Fans	Number of Cooling Coils	Manufacturing Time (hours)
Economy	1	1	8
Standard	1	2	12
Deluxe	1	4	14

For the coming production period, the company has 200 fan motors, 320 cooling coils and 2400 hours of manufacturing time available. The Company wishes to maximize the total profit.

(a) Formulate the given problem as a Linear Programming Problem.   (3 marks)

(b) Set up the initial simplex tableau by including the necessary slack variables.   (2 marks)

(c) Determine the second simplex tableau by using the simplex method.   (4 marks)

Given the following final tableau:

C_j		63	95	135	0	0	0	
	Solution Mix	X_1	X_2	X_3	S_1	S_2	S_3	Quantity
63	X_1	1	0	-2	2	-1	0	80
95	X_2	0	1	3	-1	1	0	120
0	S_3	0	0	-6	-4	-4	1	320
	Z_j	63	95	159	31	32	0	16440
	$C_j - Z_j$	0	0	-24	-31	-32	0	

S_1 – slack for total fan motors available
S_2 – slack for total cooling coils available
S_3 – slack for total manufacturing time available

(d) How many economy models, standard models, and deluxe models should the company produce in order to maximize profit and what is the maximum profit?

      (2 marks)

(e) Determine the dual price of total fan motors available and discuss the effect of increasing the fan motors on total profit.   (3 marks)

(f) Determine the range of optimality for the profit contribution rate of Economy model air-conditioner.   (3 marks)

(g) Determine the range for the right hand side of the second constraint without changing the dual price.   (3 marks)

[Total: 20 Marks]

Question 2

The Jaya Grocer Supermarket stocks Munchies Cereal. Demand for Munchies is 4,805 boxes per year. It costs the supermarket RM 50 per order of Munchies, and it costs RM 0.80 per box per year to keep the cereal in stock. Once an order for Munchies is placed, it takes 4 days to receive the order from a food distributor. The supermarket operates for 365 days.

(a) What is the Economic Order Quantity?   (3 marks)

(b) What is the average inventory?   (2 marks)

(c) What is the annual holding cost?   (2 marks)

(d) How many orders per year would be placed?   (2 marks)

(e) What is the annual ordering cost?   (2 marks)

(f) What is the total annual inventory cost?   (3 marks)

(g) What is the reorder point? Interpret your result.   (4 marks)

(h) Suppose that the demand during the lead time is normally distributed, with a mean of 1,000 boxes and a standard deviation of 200 boxes. How much safety stock should the supermarket carry to maintain a 96% service level?

(2 marks)

[Total: 20 Marks]

Continued...

Question 3

(a) Touche Young has three auditors. Each can work as much as 160 hours during the next month, during which time three projects must be completed. Project 1 will take 130 hours; project 2, 140 hours; and project 3, 160 hours. The amount per hour that can be billed for assigning each auditor to each project is given in the table below.

Auditor	Project ($)			Available (hours)
	1	2	3	
Alex	16	14	15	160
Bob	18	15	11	160
Claire	20	15	12	160
Demand (hours)	130	140	160	

i) Use the Northwest Corner Method to find the initial solution.   (5 marks)

ii) Determine the optimal distribution plan that minimizes the total cost.   (9 marks)

(b) A department head has four subordinates and four tasks to be performed. The subordinates differ in efficiency and the tasks differ in their intrinsic difficulty. His estimate of the times (in hours) each subordinate would take to perform each task, in given in the effectiveness matrix below. Each task can be assigned to only one subordinate.

TASK	SUBORDINATE			
	I	II	III	IV
A	8	26	17	11
B	13	28	4	26
C	38	19	18	15
D	19	29	24	10

Use the Hungarian method to determine the optimum assignment.

(6 marks)

[Total: 20 Marks]

Continued...

Question 4

There 8 activities involved in an accounting research project. Each of the activities has its expected time (in weeks) and variance as provided in the table below.

Activity	Immediate Predecessor	Optimistic	Most Likely	Pessimistic
A	-	1	3	5
B	-	2	5	8
C	A	3	4	5
D	B	2	3	10
E	B	2	3	4
F	C, D	3	5	7
G	C, D	1	2	6
H	E, F	4	6	8
I	F, G	1	3	5
J	H	1	2	3

(a) Draw the network for this project.   (6 marks)

(b) Compute the earliest start time (ES), latest start time (LS), earliest finish time (EF), latest finish time (LF) and slack time for each activity.

                                                        (7 marks)

(c) Find the critical path and completion time of the overall project.   (2 marks)

(d) Calculate the variance in the expected completion time for the project.   (3 marks)

(e) What is the probability that the project will be completed in 23 weeks?   (2 marks)

[Total: 20 Marks]

Continued...

Question 5

The Shanon Company is going to introduce one of three new products: a widget, a hummer or a nimnot. The market conditions (favorable, stable or unfavorable) will determine the profit or loss the company realizes, as shown in the following payoff table:

Product	Market Conditions		
	Favorable	Stable	Unfavorable
Widget	$120,000	$70,000	-$30,000
Hummer	60,000	40,000	20,000
Nimnot	35,000	30,000	30,000
Probability	0.2	0.7	0.1

(a) Determine the best decision, using the following decision criteria:

   i) Maximax   (2 marks)

   ii) Maximin   (2 marks)

   iii) Hurwicz criterion of realism $(\alpha = 0.4)$ (3 marks)

   iv) Equally Likely   (2 marks)

   v) Minimax regret   (4 marks)

   vi) Expected Monetary Value   (3 marks)

(b) Determine how much the firm would be willing to pay to a market research firm to gain better information about future market conditions.

(4 marks)

[Total: 20 Marks]

End of Page.

Appendix: Z-table

	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974